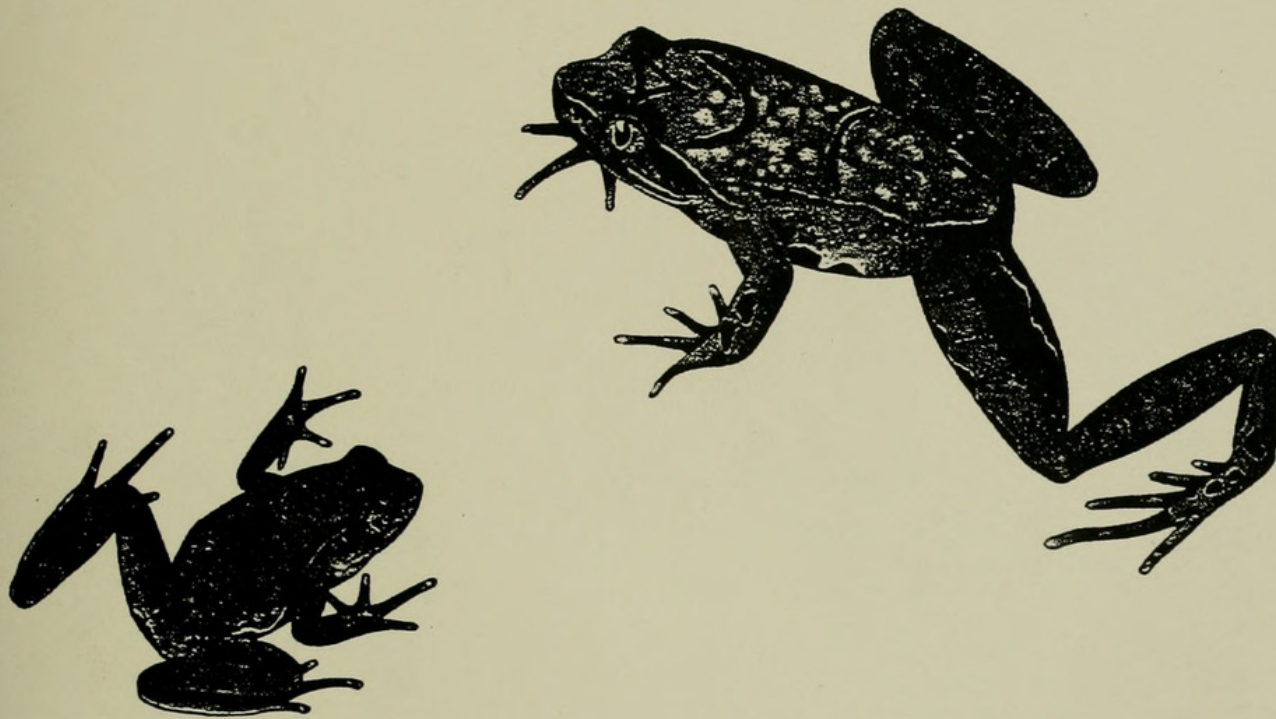
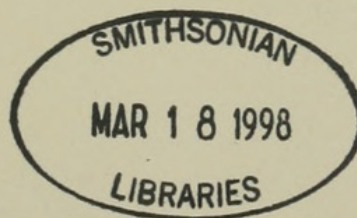


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TRANSLATIONS
OF
TWO NEW SPECIES OF AMPHIBIANS IN TIBET
<HUANG & FEI 1981>
AND
DESCRIPTION OF TWO NEW SPECIES OF THE GENUS MEGOPHRYS
<FEI, YE & HUANG 1995>



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&
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Royal Ontario Museum



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INTRODUCTION

Since 1994 we have been collaboratively involved in biodiversity inventories in Vietnam. Our investigations, conducted in association with the Institute of Ecology and Biological Resources (Hanoi) and the Zoological Institute of St. Petersburg (Russia), have led us to understand that the amphibian fauna of Vietnam is poorly known. The most current, comprehensive review of the amphibians of this region was done by BOURRET (1942). Bourret estimated that 82 species of amphibians occurred in Vietnam. However, our recent efforts suggest that this figure grossly underestimates Vietnam's amphibian diversity.

As we work to identify our herpetological collections from Vietnam, it is imperative that we have access to the literature that includes the herpetofauna from regions adjacent to Vietnam. In addition to BOURRET (1942), the reviews of INGER (1954, 1966) on the Philippine Islands and Borneo, respectively, and TAYLOR'S (1958, 1962) reviews of Thailand herpetofauna have been indispensable. However, a great deal of Vietnam's herpetofauna is shared with China. The works of POPE (1931) and LIU (1950) have supplied us with the older descriptions of many Chinese amphibians. Since the mid 1980's much significant work has originated from within China. Several new species have been described and numerous taxonomic accounts and revisions have been given in Chinese. Recently, we began to translate these descriptions, particularly those pertaining to megophryid frogs. The papers are likely to be useful to other biologists, and we present two of these translations herein:

YONG-ZHAO HUANG AND LIANG FEI. 1981. Two new species of amphibians in Tibet. *Acta Zootaxonomica Sinica* 6(2): 211-215.

LIANG FEI, CHANG-YUAN YE AND YONG-ZHAO HUANG. 1992. Description of two new species of the genus *Megophrys*, Pelobatidae (Amphibia: Anura) from China. *Zoological Research* 13(1):5-12.

These articles describe four species of anurans — *Megophrys pachyproctus* HUANG, *Rana conaensis* FEI AND HUANG, *Megophrys glandulosa* FEI, YE AND HUANG, and *Megophrys mangshanensis* FEI AND YE — from southern and western China.

Literal translations of text from Chinese to English often creates long, complex sentences. We have endeavored to maintain as literal a translation as possible, but without compromising English grammar. Consequently, some Chinese sentences have become multiple English sentences.

ACKNOWLEDGMENTS

Translation of these articles was funded by the Natural Sciences and Engineering Research Council (NSERC) grant A3148 to R.W. Murphy. This SHIS publication is contribution 85 from the Centre for Biodiversity and Conservation Biology, Royal Ontario Museum. The figures were scanned from the original publication and the gray background was removed using Adobe PhotoShop.

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Two New Species of Amphibians in Tibet

Yong-zhao Huang

(Northwest Plateau Institute of Biology, Academia Sinica)

Liang Fei

(Chengdu Institute of Biology, Academia Sinica)

In May and June of 1977, based on the initial survey of the amphibians of Tibet in 1973, the Northwest Institute of Biology, Academia Sinica, once again, went to Yadong, Chuona, Motuo in the south part of Tibet for an important survey. We also made short visits to Rikaze, Langxian, Linzi, Bomi, Mangkang, and other places. We found two new species. Type specimens are kept separately in the Northwest Plateau Institute of Biology, Academia Sinica, and the Chengdu Institute of Biology, Academia Sinica.

New species: *Megophrys pachyproctus* Huang, sp. nov.

Type species: Holotype ♂ (No. 770650), Allotype ♀ (No. 770652) and Paratype 1 ♂ (No. 770651), all collected on July 28, 1977 in Gelin, Motuo County, Tibet at an elevation of 1530m by Huang Yongzhao.

Diagnostic Characters: This new species is very similar to *Megophrys minor* Stejneger. The main differences are: the new species bears a vomerine ridge, lower part is swollen and bears thin teeth; the posterior end of the body of the male protrudes a slight bit and has an arc-shaped swelling. However, *M. minor* does not bear vomerine teeth, the posterior body of male does not have an arc-shaped swelling. Compared with *M. omeimontis*, body shape of adult new species is distinctly smaller.



Figure 1. *Megophrys pachyproctus* #770650 ♂

M. pachyproctus

Gelin, Motuo, Tibet

Character	Holotype specimen 770650	2 ♂♂	1 ♀	Character	Holotype specimen 770650	2 ♂♂	1 ♀
Body length	35.3	35.3–36.2 35.8	35.8	Forearm and hand length	17.9	17.9–18.4 18.2 50.8%	18.7 52.2%
Head length	12.5	12.5–13 12.8 35.8%	12.5 34.6%	Forearm width	2.7	2.5–2.7 2.6 7.3%	2.4 6.7%
Head width	12.4	12.4– 12.8 12.6 35.2%	12.9 36%	Hand length	9.9	9.9–10.1 10 27.9%	10.4 29.1
Snout length	4.8	4.7–4.8 4.75 13.4%	4.5 12.6%	Total length of leg	55.5	55.5–60 57.8 161.5%	60 167.6%
Internasal space	4	4 11.2%	3.9 10.9%	Tibia length	17.1	17.1–17.8 17.5 48.9%	17.8 49.3%
Interorbital space	4	4 11.2%	4.3 12%	Tibia width	4.8	4.3–4.8 4.6 12.8%	4.2 11.7%
Eyelid width	3.5	3.5–3.8 3.7 10.3%	3.2 8.9%	Tarsus and foot length	25.6	25.6–27 26.3 73.5%	27.5 26.8%
Diameter of eye	4.9	4.8–4.9 4.85 13.7%	4.7 13.1%	Foot length	16.8	16.8–17 16.9 47.2%	17.4 48.4%
Tympanum	1.7	1.7 4.7%	1.7 4.7%				

Note: Measurements are in mm, percentages are the comparison of each part with body length.

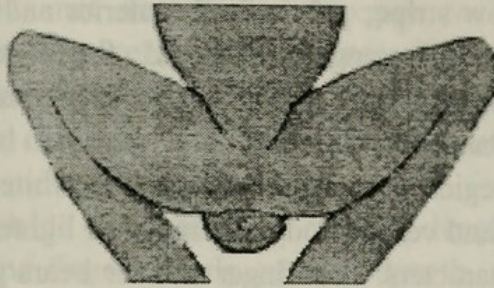


Figure 2. *Megophrys pachyproctus* showing anal region

Description of morphology: Body length of male 35.3–36 mm; head flattened, length and width nearly equal; snout tip bluntly rounded, shield like, distinctly protruding over lower lip, dorsal part of snout region concave; canthus rostralis very distinct, loreal region vertical and cheek surface concave; nostrils not easily seen in dorsal view, they are in the middle of snout and eyes; internasal space equal with interorbital space but a little larger than upper eyelid width; pupils vertical; tympanum oval, far away from eyes, about same distance as diameter of tympanum; two slanting vomerine ridges, posterior end swollen, bearing teeth, right and left not in contact; posterior end of tongue rounded, weakly notched.

Forearm narrow; finger tips rounded; no web between fingers; fingers long and narrow, digital formula: 3,4,2,1, first and second fingers nearly equal in length; no subarticular tubercles; inner metacarpal tubercles flattened but not very distinct. Hindlimb long, tibio-tarsal articulation reaches anterior to eye, right and left heels slightly overlapping, tibia length does not reach half of body length; toe tips rounded; no lateral fringes on toes, no web between toes; toes long and narrow, third slightly longer than fifth toe; no subarticular tubercles; at the base of the first toe is a swollen-like tubercle; inner metatarsal tubercles flattened, no outer metatarsal tubercles.

Skin rough, dorsal body and four limbs all bear small light red warts both in rows and sparse, warts on middle of posterior dorsal occipital region "X"-shaped; longitudinal skin ridge from posterior supratympanic fold to hip with light red warts on it; skin folds at upper eyelid with many distinct folds; supratympanic fold obtusely angled, the part inclined to shoulder is thicker, warts also appear on folds; posterior end of the body of male protrudes slightly and appears as an arc-shaped swelling, then inclines to ventral body and reaches anal region. Dissected view: formed by a mass of adipose tissue under protruding skin, posterior of female does not have arc-shaped swelling. A few small round warts appear on lateral body and dorsal part of four limbs, femur and tibia are typical; a pair of light colored white glands appear on lateral chest; a pair of posterior femur glands present.

In life, dorsal body brownish yellow or dark brown; triangular dark marking edged with lighter color appear between the eyes; color along warts darker; upper lip edge bears light alternating with dark longitudinal stripes, one below eyes larger; color below supratympanic fold darker; 2–4 dark transverse stripes on forearms, and 4–5 on either side of femur and tibia; grayish brown or black-brown around vent, dorsally it is edged

with grayish white narrow stripe; pelvis, both anterior and posterior femur and anterior part of ventral femur are all orange-red colored; finger and toe tips light red; tarsal, metatarsal and ventral toes grayish brown or black-brown; many grayish black spots scattered on lateral body and whole ventral body, a grayish black short longitudinal stripe in the middle of throat region is distinct; small milky white spots along lower lip edge. Color marking on dorsal and ventral body in female are lighter than in male.

Secondary sex characters: first finger of male bears gray nuptial pad, with dense nuptial spines on it; internal single subgular vocal sac exists, opening of vocal sac small and interrupted; posterior body has swelling which protrudes a little bit and arc-like; no linea musculinae.

Ecology: On a rainy night of July 28, 1977, in the forest about 1500m above sea level, following the call that was a continuous "gazhi—gazhi—gazhi—.....", two male *Megophrys* were collected in the bushes and branches of shrubs; a female was collected beside road which was not far away from a flowing ditch.

New species *Rana conaensis* Fei et Huang, sp. nov.

Rana liebigii Herpetology Research Section, Sichuan Institute of Biology, 1977, Acta Zoological Sinica, 23(1):56–57. (specimen from Chuona)

Type specimen: Holotype ♂ (No. 770531, collected on June 30, 1977 in Mama, Chuona County, Tibet at the elevation 2900m, by Huang Yongzhao), allotype ♀ (No. 770532, collected at the same time and same place with holotype), paratype (22♂♂, 8♀♀, 26 juveniles, ova and tadpoles, collected on June 24–30, 1977 in Mama, Chuona County, Tibet, at the elevation of 2900–3400m, Northwest Institute of Biology. 2 ♂♂, 1 ♀, 3 juveniles and tadpoles, collected on August 7 in Mama, Chuona County, Tibet at the elevation of 2900m, Chengdu Institute of Biology¹)

Diagnostic Characters: The new species is similar to *Rana liebigii* Guenther. Body size of new species is small, the largest body length of adult frog is not greater than 70mm, no dorsolateral fold; skin on both sides of anal region forms a slight "Λ"-shaped air-filled sac, very distinct; internal arm of male frog does not bear cone-shaped black spines. Body size of *Rana liebigii* large, the greatest body length of an adult frog is more than 100mm; dorsolateral fold exists; skin on anal region does not bear air-filled sac; inner arm of male bears cone-shaped black spines.

Description of morphology: Average body length is 58mm in males, 55mm in females; head width slightly larger than head length, snout tip bluntly rounded, protruding

¹ * In 1977, two ♂♂, one ♀, three juveniles collected by Mr. Wenxuan Chao of Fishery Institute of Biology, Academia Sinica in Mama, Chuona County on August 7, 1974, were regarded as *Rana liebigii*. Now after obtaining more of the same species, we think they should be this new species, *Rana conaensis*.

over mandible; canthus rostralis not distinct, loreal region inclines outward; nostrils slightly closer to eyes, internasal space larger than interorbital space or upper eyelid width; pupils rounded; tympanum hidden; vomerine teeth in two short rows, slanting from choanae to mid-line, rows closer together posteriorly; large tongue, deeply notched at posterior end.

Forearm and hand length do not reach half of body length; finger tips ball-like, formula 3,4,1,2, first and second fingers nearly equal in length, slight lateral fringes on fingers; subarticular tubercles near tips of fingers distinct; three metacarpal tubercles, inner metacarpal tubercles big and oval shape, outer metacarpal tubercles small, narrow and long, hindlimb thick and strong, tibio-tarsal articulation extends anterior to eyes or nostrils, right and left heels overlap; tibia length larger than half of body length, tibia and foot almost same length; comparisons between toes and fingers, third and fifth toe almost same length; completely webbed between toes, first and fifth toe have very distinct lateral fringes, fringes over half the length of the web; subarticular tubercles distinct; inner metatarsal tubercles long oval shape, no outer metatarsal tubercles; no tarsal fold.

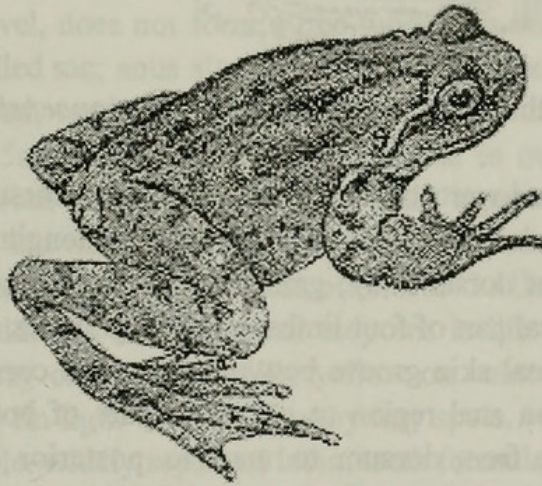


Figure 3. *Rana conaensis* ♂ No. 770531

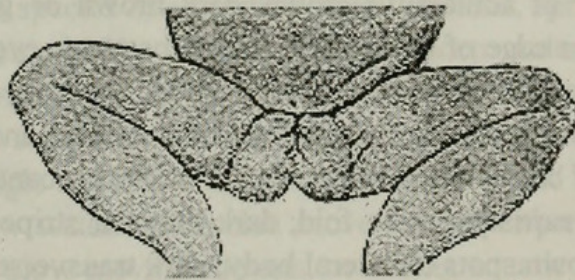


Figure 4. *Rana conaensis* showing anal region

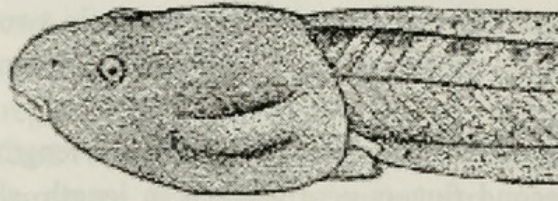


Figure 5. Tadpole of *Rana conaensis* showing air-filled sac.

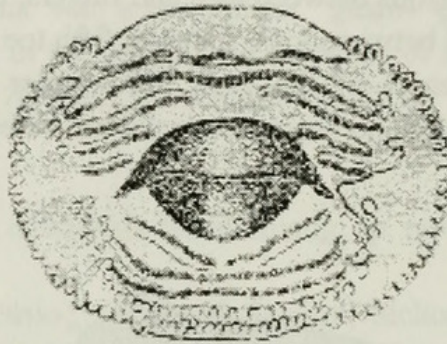


Figure 6. Mouth region of a tadpole of *Rana conaensis*

Skin smooth, small round warts or long warts sparse on dorsum and lateral body, dense on posterior body; no dorsolateral fold, only broken longitudinal rows of skin ridges on both sides of anterior dorsal body; granules scattered on warts or among skin ridges and on lateral head, dorsal part of four limbs, warts or granules all bear black spines or light spiny marks; horizontal skin groove between posterior corners of eyes; supratympanic fold distinct. Skin on anal region at posterior part of body in male loose, it forms a slight “^”-shaped sac from dorsum to anus to posterior base of thigh, very distinct, but not as distinct in females compared to that of males, absent in juveniles. Skin on ventral body smooth, two bunches of cone-shaped black spines on lateral chest of male, after black spines fall off, only two bunches of light fleshy tubercles remain; small spiny warts scattered on posterior part below tarsal and metatarsals.

In life, dorsal body of adult olive-brown, dark brown or grayish brown; black transverse stripe on anterior edge of transverse groove between eyes; three longitudinal rows of black-brown, small and big spots on dorsal body, generally linked to form three faint longitudinal stripes from posterior eyes along dorsal midline and both sides of body directly to posterior part of body; black-brown stripe starts on canthus rostralis through the eyes to the level below supratympanic fold; dark irregular stripes on both upper and lower lip edges; grayish brown spots on lateral body; dark transverse stripes on forelimbs mostly irregular; broken markings mostly appear on posterior thigh, some are not very clear. Ventral body grayish white or milky white, grayish brown or dark brown spots densely scattered on throat, chest and lateral belly, spots on posterior part of ventral

body and upper ventral thigh are few or none. Dorsal body of juveniles mostly olive-green, three longitudinal stripes on dorsal body very distinct; dorsal part of forelimbs olive-brown or grayish brown, transverse stripes on forelimbs very distinct; as size increases, green color on dorsal body will eventually decrease till reaching color of adult.

Secondary Sex Characters: Forelimb thick and strong, first and second fingers bear black cone-shaped nuptial spines, inner side of third finger also bears several nuptial spines in a few specimens, two bunches of black cone-shaped spiny warts on lateral side of chest; internal single subgular vocal sac exists, opening of vocal sac is a slit and interrupted; linea musculinae exists on lateral body.

Eggs: Diameter of eggs is 3–3.5mm, animal pole brownish gray, vegetable pole milky yellow; two layers of gelatinous membrane are outside of eggs, outer layer thick and very sticky.

Tadpoles: In life, dorsal body olive-brown or dark brown, dorsal part of musculus caudalis bears 3–5 dark transverse stripes or spots, color of caudal fin slightly lighter, dark brown spots densely scattered on caudal fin. Ventral body light colored, liver and intestine can be seen. When hindlimb bud is 3.4–7mm long, total body length is about 65mm, snout rounded, eyes dorsolaterally on head; spiracle on left side of body slanting to posterior upper level, does not form a free tube; skin on posterior lateral body loose, forming a slight air-filled sac; anus slants open on right side below base of tail; musculus caudalis well developed, caudal fin low, posterior tip bluntly rounded; mouth on ventral side of snout, about 5mm wide, lip wide, no papillae in middle part of upper lip, two rows of papillae on both sides of upper lip, widely separated from each other, external row of papillae small and dense, internal row big and sparse, near labial teeth; some bear 3–5 additional papillae; labial tooth formula often II: 3-3 / II: 1-1, individual II: 4-4 / II: 1-1 or II: 3-3/III. In addition, color of small tadpoles in life with an average 23mm body length is brownish gray on dorsum; milky yellow on venter; milky yellow on musculus caudalis, also; caudal fin light with sparse gray tiny spots, two rows of papillae on corner of mouth and mandible, widely separate; labial teeth formula often II: 2-2 / II: 1-1, some I: 3-3 / II: 1-1 or II: 3-3/ II: 1-1. When tail length of tadpole in metamorphosis is 8–14mm, body length is 19–23.2mm, essentially having adult frog characteristics, warts or skin ridges on dorsal body starts to show, transverse stripes on forelimbs are more regular and clearer than adults.

Ecology: This species often rests in small streams, spring runs and nearby water puddles at an elevation of 2850–3400m, mostly hidden under rocks, fallen trees beside streams or under roots beside ditches, occasionally stays on rocks beside the bank or among bushes, when scared, jumps into water immediately and escapes, very hard to catch. Eggs either single or several linked together and stuck unevenly on fallen trees or under rocks in shallow water. Tadpoles move around either in the cracks of rocks or under stones in small slow moving streams, or among aquatic plants beside spring water or slow areas under the tree roots.

Rana conaensis

Mama, Chuona Tibet

Character	Holotype specimen 770531	20♂♂	9♀♀	Character	Holotype specimen 770531	20♂♂	9♀♀
Body length	57.6	43.5-69 58	46.1-68.4 55.2	Forearm and hand length	26.2	21.2-33.5 27.6 47.6%	21.7-27.6 24.3 44%
Head length	18.3	15-22 18.8 32.4%	15.2-21 17.8 32.2%	Forearm width	9.5	5.2-12.3 9.4 16.2%	4.3-6.5 5.4 9.8%
Head width	20.8	16-24 20.2 34.8%	16.6-23.7 19.5 35.3%	Hand width	15.9	13.3-20.5 17.2 29.7%	13.5-17.2 15.1 27.4%
Snout length	8.3	6.4-9.3 8.2 14.1%	6.9-9 7.8 14.1%	Total length of leg	102	75-132 103.6 178.6%	80-107 92.6 167.8%
Internasal space	6.4	4.7-7 6.1 10.5%	5-6.5 5.7 10.3%	Tibia length	31.5	24.5-40.7 32.2 55.5%	25.4-33.3 29.2 52.9%
Interorbital space	4	3.6-5 4.4 7.5%	3.5-4.2 3.9 7.1%	Tibia width	8.5	6.8-12.1 10.2 17.6%	7.4-10 8.6 15.6%
Eyelid width	4.7	3.3-5.4 4.7 8.1%	4-5.2 4.5 8.2%	Tarsal and foot length	46	34.4-58.3 46.2 79.7%	35.7-47 41.6 75.4%
Diameter of eye	6.3	5.2-7.5 6.3 10.9%	5.3-8 6.2 11.2%	Foot length	31	23.5-39.5 31.4 54.1%	24.4-31.7 28.1 50.9%

10 tadpoles of *Rana conaensi*

Mama, Chuona, Tibet

Total body length	59.3–70.4 64.4	Snout to spiracle	12–14 13 59.6%	Tail height	10–11.2 10.6 48.6%
Head and body length	20.4–23 21.8	Interorbital space	4.6–5.2 4.9 22.5%	Musculus caudalis width	5.6–6.8 6.3 28.9
Body height	10–11.2 10.6 48.6%	Mouth width	4.3–5.2 5 22.9%	Hindlimb	3.4–7 4.9 22.5%
Body width	13–14.5 13.4 61.5%	Tail length	38.5–48.2 42.6 195.4%		

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Description of two new species of the Genus *Megophrys*, Pelobatidae (Amphibia: Anura) from China

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Abstract: In 1975 and 1987, two species of *Megophrys* were collected separately in Yizhang, Hunan and Jingdong, Yunnan. Afterwards, we compared them to existing species of *Megophrys*, especially to the similar species *M. lateralis* (Anderson) using external morphology and characters of the skull. We found they were greatly different, so we regard them as two new species, *M. mangshanensis* and *M. glandulosa*. This article gives a description of the morphology and ecology of these two new species.

Key words: Amphibia, Pelobatidae, *Megophrys mangshanensis* new species, *M. glandulosa* new species, systematics.

During our expeditions to Yizhang, Hunan in 1975, and Jingdong, Yunnan in 1987, we found two types of species of *Megophrys*, Pelobatidae. After a comparison of these species to existing species of the genus, we found their body sizes, shapes, and morphological characters to be very close to *M. lateralis*. After further studies of these three similar species using their external morphology and the characters of skull, we found them distinctly different (please see Table 1, figure 1-4 and Liu, 1961). Therefore, we believe the two specimens collected from Jingdong, Yunnan and Mangshan, Hunan are new species and we name them as *M. glandulosa* and *M. mangshanensis*.

Type specimens are all kept in Chengdu Institute of Biology, Academia Sinica.

Now the description of the morphology and ecology are recorded as follows:

***Megophrys glandulosa* Fei, Ye et Huang, new species**

Holotype: No. 873112, adult male; Wuliang Shan, Jingdong, Yunnan Province. elevation 1900m, collected on March 29, 1987 by Fei Liang.

Allotype: No.873201, adult female; Wuliang Shan, Jingdong, Yunnan Province. elevation 2100m; collected on May 2, 1975.

Paratype: 25 ♂♂, 2 ♀, collected in the same place as the holotype, elevation 1900-2100m; collected on March 29-30, 1987 by Fei Liang, Huang Yongzhao, Luo Jiarui.

Diagnostic characters: the main distinguishing differences of this new species from the similar species *M. lateralis* (Anderson) are: snout pointed; big swollen bean-like gland at the posterior part of supratympanic fold; many large warts on side of body; toes with wide fringes; numerous large, dark spots on posterior part of belly and ventral part of thighs; nasals in contact with sphenethmoid; squamosal separated from frontoparietal, prootic on dorsal part entering the orbit. In comparison, in *M. lateralis*; snout short and rounded; no bean-like gland on posterior part of supratympanic fold; small warts on side of body; toes with narrow fringes; no spots on posterior part of belly and ventral part of thighs; nasal not in contact with sphenethmoid; squamosal in contact with frontoparietal, prootic on dorsal part not entering the orbit.

Description of morphology: male body length 76.3–81mm, female 76.5–99.5mm. head flattened, head width slightly larger than head length, snout shield-like, narrow and pointed, obviously extending over mandible; canthus rostralis very distinct, loreal region almost vertical, slightly concave; tympanum distinct; large tongue, pear-shaped, posterior end slightly notched; vomerine ridge very distinct, inclined medially, 3–4 teeth at end of ridge.

Finger tips ball-like, second finger shorter than first and fourth fingers; no subarticular tubercles, inner metacarpal slightly distinct. Hindlimb long, tibio-tarsal articulation extends anterior to nostril up to tip of snout, right and left heels overlapping, tibia length greater than half of body length; finger tip and toe tip same; third toe slightly longer than fifth toe; toe with very wide fringe (narrow in female), base of toes with rudimentary web; no subarticular tubercles, inner metatarsal tubercles flatten, a little distinct, no outer metatarsal tubercles.

Dorsal skin smooth, more small warts on head and shoulder, less on anterior part of dorsal body, big granules between shoulders forms narrow skin ridge in the shape of a "V"; several distinct small granules on posterior body; both sides of body bear a longitudinal skin ridge formed by small warts. Big warts on lateral body, roughly over ten on each side, small warts dispersed among them; external fringe of upper eyelid bears a undistinguished horn; supratympanic fold long, straight and flat anteriorly, curving over the tympanum extending to the shoulder, and gradually expanded, terminating in a bean-like gland; upper and lower lip margins, temporal region, and tympanum all bear a few small tubercles; edge of upper lip bears small saw tooth-like papillae; dorsal part of fore limbs bear a few small tubercles. Entire ventral skin smooth, a pair of axillary glands located on the chest laterally, very small, distinctly smaller than width of finger tip; round warts at posterior femur are very obvious; femoral gland round, larger than width of toe tip.

Secondary sex characteristics: male has brown black nuptial pads on first and second fingers, and an internal single subgular vocal sac, opening of vocal sac is long and interrupted.

Table 1. Comparison in morphological characters of three closely-related species of *Megophrys*

Species		<i>M. glandulosa</i>	<i>M. mangshanensis</i>	<i>M. lateralis</i>
Location		Jingdong, Yunnan	Mangshan, Hunan	Mengyang, Yunnan
Elevation		1900–2100m	1000m	700m
Head bones	anterior end of ethmoid cartilage	sharp	round	round
	right and left nasals	in contact	separate	in contact
	nasal and sphenethmoid	overlapping	overlapping	separate
	squamosal and frontoparietal	wide separate	in contact	in contact
	prootic	entering the orbit	not entering the orbit	not entering the orbit
External characters	snout region	narrow and sharp	wide and round	wide and round
	posterior part of supratympanic fold	expand to be bean-like	not bean-like	not bean-like
	warts on dorsal body	big and dense	small and sparse	small and sparse
	fringes on side of toe	very wide	none	narrow
	web between toes	rudimentary web	no web	rudimentary web
	patterns on dorsal body			
	stripe of upper lip margin	1	2	1
	throat region	light colored, black spots on both sides of throat	dark colored, no spots on both sides of throat	light colored, dark stripes on both sides of throat
	ventral body and ventral side of thigh	dark spots	no spot	no spot

Table 2. Measurements of *Megophrys glandulosa*

	Holotype ♂	10 ♂♂	3 ♀♀		Holotype ♂	10 ♂♂	3 ♀♀
Body length	78.4	76.3–81.0 78.2	76.5–99.5 87.0	Forearm and hand length	37.0	34.6–38.0 36.4 46.5%	34.6–43.9 40.0 46.0%
Head length	28.6	27.7–30.5 28.8 36.8%	28.7–32.6 30.1 34.0%	Forearm width	6.8	6.5–9.4 7.6 9.7%	5.6–9.0 7.7 8.9%
Head width	29.5	28.2–31.1 29.4 37.6%	30.5–35.2 32.1 36.9%	Hand width	21.6	20.5–23.0 22.0 28.0%	20.4–21.3 20.7 24.0%
Snout length	10.8	9.3–11.0 10.3 13.2%	10.2–12.1 11.1 12.8%	Total length of leg	142.0	130.0–146.0 139.6 178.5%	137.0–161.0 146.3 168.2%
Interorbital space	8.8	7.0–9.5 8.0 10.2%	8.2–9.4 8.9 10.2%	Tibia length	46.8	43.9–47.3 46.0 58.5%	42.3–49.8 47.1 54.1%
Eyelid width	7.0	6.5–7.6 7.0 9.0%	7.0–8.2 7.4 8.5%	Tarsal and foot length	61.2	57.8–64.3 62.0 79.3%	57.6–71.5 64.6 75.1%
Diameter of eye	10.0	9.7–10.8 10.3 13.2%	9.0–10.7 9.8 11.3%	Foot length	40.6	38.8–43.2 41.2 52.7%	39.0–47.2 44.1 50.7%

Note: Measurements in mm, percentages are comparisons with body length.

In life, dorsal body dark brown or brownish gray, brownish black triangular spot appears between eyes, patterns vary tremendously in the middle of dorsum, most often "V"-shaped spot outlined with light colored stripe, on top of shoulder; irregular spots generally on posterior part of dorsum; dorsolateral, longitudinal skin ridge on dorsum dark brown; yellowish white color on top of supratympanic fold, black-brown color on canthus rostralis and below supratympanic fold; a yellowish white longitudinal stripe on upper lip region from nostril to posterior part of angle of jaw; large warts on dorsal body mostly are either bright yellow or part black and part yellow; warts on posterior femur and femoral gland are both bright yellow. Gray, tiny spots show on throat, edge of mandible bears light yellow spots, either side of throat bears an arc-shaped white narrow stripe, external side of stripe appears dark reddish brownish black and extends to anterior shoulder, which forms bilateral symmetrical big spots; yellowish white color on ventral body and ventral part of thigh region,

region, scattered densely with dark spots; internal part of forelimb and dorsal part of fingers bear very distinct dark spots; dorsal hindlimb brownish gray, bears 3–4 dark brown transverse stripes; color on dorsal part of limbs are dark, and gradually changes to a lighter color ventrally, ventral parts of metacarpals and metatarsals grayish black, color on ventral part of fingers and toes tips are light.

Characters of skull: Based on skulls of three male specimens No. 873063, 873065 and 873071 and one female specimen No. 873068, premaxilla almost vertical, alary process of premaxilla slightly inclined forward; anterior part of ethmoid cartilage narrow and sharp; right and left nasals in contact at the mid-line, nasal and sphenethmoid overlap, not in contact with frontoparietal, sphenethmoid enters orbit on dorsal part; squamosal not in contact with frontoparietal, prootic enters orbit dorsally.

Ecological data: This frog lives in the mountain areas in coniferous and broad-leaf mixed forests at elevations of 1900–2100m. They occur in slowly flowing streams with bushes and grass growing on both sides of the banks. The water is very clear and there are many rocks in the water. This frog makes a continuous “xia, xia, xia, ……” sound in the afternoon and evening in March and April, making more sounds in the evening. It is very easy to collect them in the evening. In a female collected during the end of March, mature eggs in the belly had entered the fallopian tubes, and the eggs appear milky-yellow in color. The diameter of the eggs is about 2.3mm, with a total 954 eggs (left side 465, right side 489). Females collected in the early May do not have mature eggs in their bellies. Based on the gravid females collected, this species of frog may have its breeding season in April.

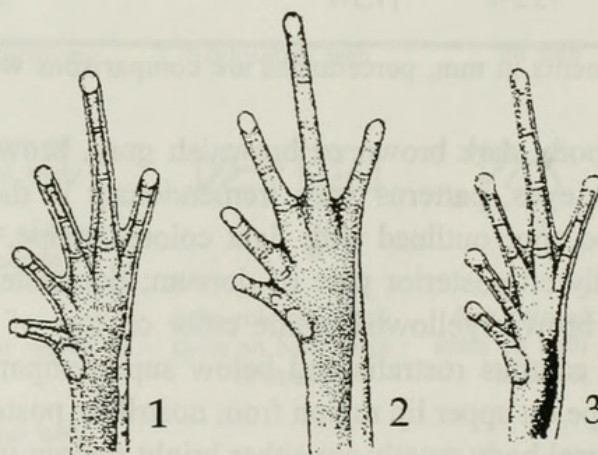


Figure 1. Foot characteristics of three similar species of *Megophrys* (ventral view)
1. *M. glandulosa* ♂ 2. *M. mangshanensis* ♂. 3. *M. lateralis* ♂ (Copied from Liu and Hu, 1961).

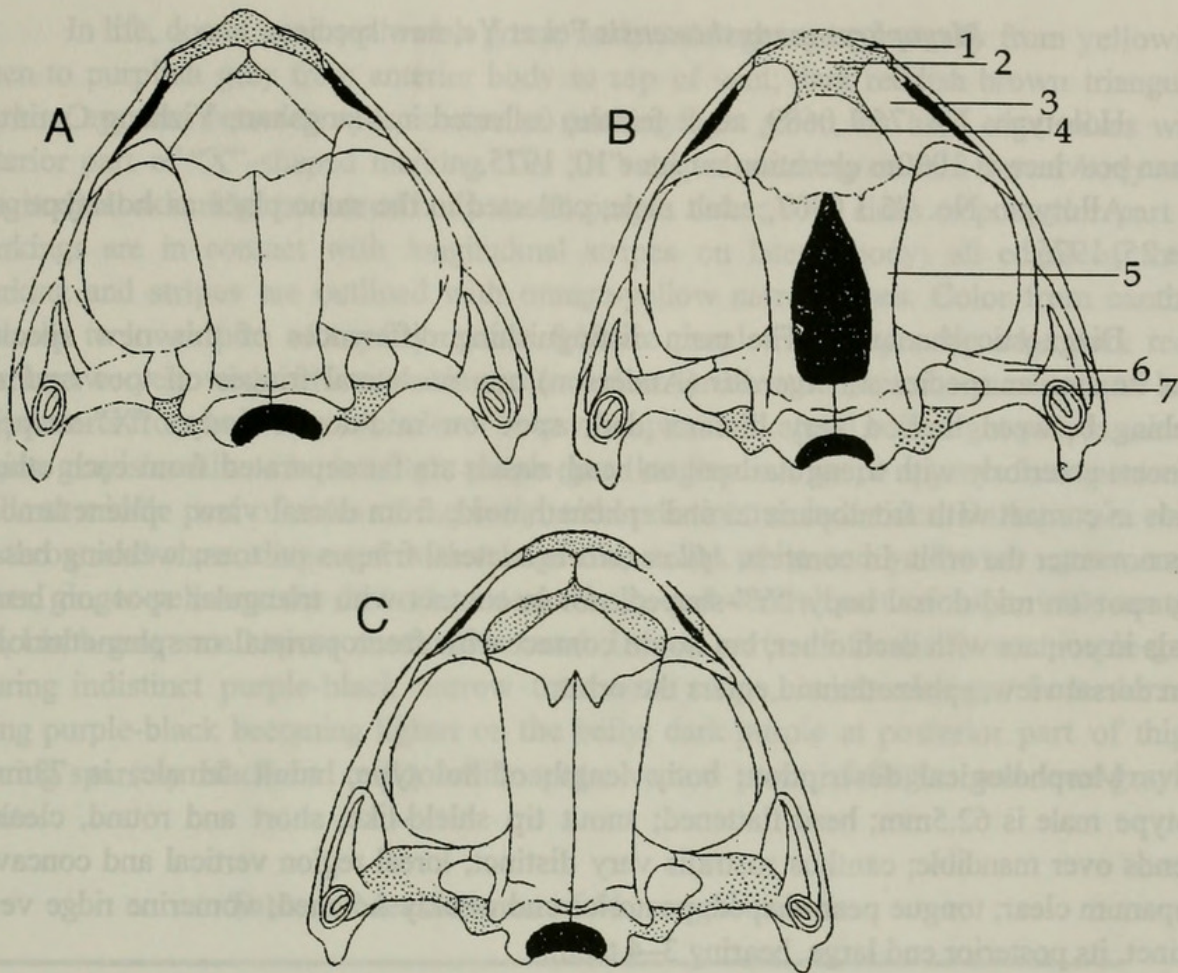


Figure 2. Skull characteristics of three similar species of *Megophrys* (dorsal view)

A. *M. glandulosa* ♂ B. *M. mangshanensis* ♂ C. *M. lateralis* ♀

1. alary process of premaxilla; 2. ethmoid cartilage; 3. nasal; 4. sphenethmoid; 5. frontoparietal; 6. squamosum; 7. prootic.

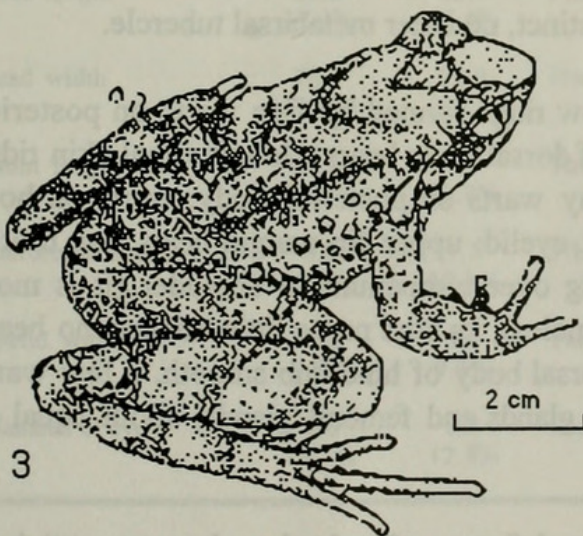


Figure 3. *M. glandulosa* ♂;

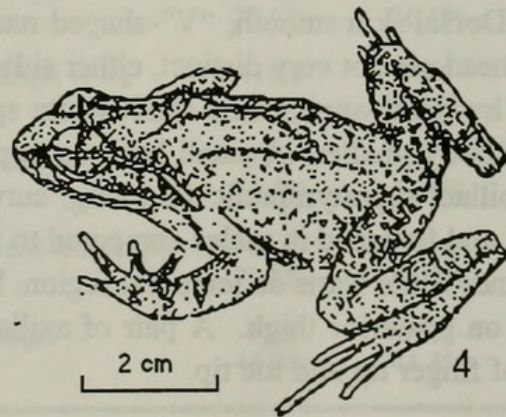


Figure 4. *M. mangshanensis* ♂.

Megophrys mangshanensis Fei et Ye, new species

Holotype: No. 75 I 0689, adult female; collected in Mangshan, Yizhang County, Hunan province at 1000m elevation on June 10, 1975.

Allotype: No. 75 I 0907, adult male; collected in the same place as holotype on June 25, 1975.

Diagnostic characters: The main distinguishing differences of this new species from its similar species *M. lateralis* (Anderson) are: no lateral fringes on toes and no webbing between toes; a very distinct dark spot on mid-dorsal body, "X"-shaped, connects anteriorly with triangular spot on head; nasals are far separated from each other; nasals in contact with frontoparietal and sphenethmoid, from dorsal view, sphenethmoid does not enter the orbit. In contrast, *M. lateralis* has lateral fringes on toes; webbing basal; dark spot on mid-dorsal body "Y"-shaped, not in contact with triangular spot on head; nasals in contact with each other, but not in contact with frontoparietal or sphenethmoid, from dorsal view, sphenethmoid enters the orbit.

Morphological description: body length of holotype, adult female, is 73mm, allotype male is 62.5mm; head flattened; snout tip shield-like, short and round, clearly extends over mandible; canthus rostralis very distinct, loreal region vertical and concave; tympanum clear; tongue pear-shaped; posterior end weakly notched; vomerine ridge very distinct, its posterior end large, bearing 3-4 teeth.

Finger tips ball-like, second finger shorter than first and fourth fingers; no subarticular tubercles, inner metacarpal tubercles weakly distinct. Hindlimb short, tibio-tarsal articulation reaches eye; right and left heels overlap, tibia length over half of body length, toe tips ball-like, third toe longer than fifth toe, no lateral fringes on toes, no webbing between toes (rudimentary web between metatarsals); no subarticular tubercles, inner metacarpal tubercle flattened, slightly distinct, no outer metatarsal tubercle.

Dorsal skin smooth, "V"-shaped narrow ridge formed by thin warts on posterior part of head are not very distinct, either side of dorsal body bears a longitudinal skin ridge formed by small warts, many small white spiny warts on posterior body; warts on both sides of body smaller. A small horn on upper eyelid; upper lip margin bears saw tooth-like papillae; supratympanic fold long, curving over tympanum to shoulder (it is more straight and flattened in males compared to females), its hind part a little thicker, no bean-like gland; white warts on temporal region. Dorsal body of hindlimb smooth, a few warts appear on posterior thigh. A pair of axillary glands and femoral glands, about equal to width of finger tip and toe tip.

Secondary sex characters: first and second fingers of males bear brown nuptial pads, internal single subgular vocal sac exists, opening of vocal sac long and interrupted.

In life, dorsal head yellowish green, body color changes gradually from yellowish green to purplish gray from anterior body to top of vent; dark reddish brown triangular marking appears between eyes, center of marking light green, its hind edge mixes with anterior part of "X"-shaped marking. The "X"-shaped marking on mid-dorsal body and longitudinal skin ridge on lateral body are all purple color; both sides of posterior part of markings are in contact with longitudinal stripes on lateral body; all edges of these marking and stripes are outlined with orange-yellow narrow lines. Color from canthus rostralis to lower part of supratympanic fold are purple-red; upper lip edge dark red, bearing two yellowish white markings, one below loreal region, another narrow and long stripe starts from below eye to a level below tympanum. Lateral body light purple, warty region grayish white, a broken light purple-gray longitudinal stripe appears from posterior axilla to middle part of sides of the belly, either distinct or indistinct. Dark purple color on throat and chest, dispersed with orange-red, milky white and yellowish green small spots; ginger-yellow color on both posterior belly and ventral part of thigh, with orange-red, black-gray small spots scattered around. Dorsal parts of forelimbs are purple-gray bearing indistinct purple-black narrow transverse stripe, colors changes from dorsum being purple-black becoming lighter on the belly; dark purple at posterior part of thigh, bearing sparsely black and milky white spots; ventral parts of fingers and toes grayish white.

Table 3: Measurement of *M. mangshanensis*

	Holotype ♀	Allotype ♂		Holotype ♀	Allotype ♂
Body length	73.0	62.5	Forearm and hand length	33.6 46.0%	26.3 42.1%
Head length	27.3 37.4%	22.1 35.4%	Forearm width	5.4 7.4%	5.4 8.6%
Head width	28.4 38.9%	22.0 35.2%	Hand length	18.9 25.9%	16.3 26.1%
Snout length	10.0 13.7%	7.5 12.0%	Total length of leg	118.0 161.6%	99.0 158.4%
Interorbital space	8.9 12.2%	7.7 12.3%	Tibial length	39.7 54.4%	32.4 51.8%
Eyelid width	7.2 9.9%	5.8 9.3%	Tarsal and foot length	53.2 72.9%	43.0 68.8%
Diameter of eye	9.6 13.2%	8.0 12.8%	Feet length	33.6 46.0%	27.7 44.3%

Skull characters: Based on the skull morphology of a female specimen 75 I 0689 and male specimen 75 I 0907, premaxilla inclined forward, from ventral view, alary process of premaxilla large; anterior part of ethmoid cartilage wide and round; right and left nasals far separated from each other, but in contact with the sphenethmoid and frontoparietal bones; from dorsal view, sphenethmoid does not enter the orbit; center of frontoparietal weakly ossified (75 I 0689) or not ossified (75 I 0907); squamosal and frontoparietal bone in contact (or fused), prootic does not enter the orbit from dorsal part.

Ecological data: This species of frogs lives either in streams of evergreen broad-leaf areas or in rich vegetated forests at about 1000m. Fallen leaves below the trees are thick, and streams are very clear; many small and big rocks occur in the streams. In middle and late June, this frog hides under fallen leaves on the roadside slopes about 20–30m from streams.

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